National Aeronautics and Space Administration

Ames

Discovery Innovations Solutions

Dr. Pete Worden, Center Director
Dr. Jacob Cohen, Chief Scientist
of NASA Ames Research Center

Weekend Workshop on CO_2-Based Manufacturing

June 28th – 29th NASA Ames Research Center

"CO_2 is taking on a new light: The waste gas is turning into a useful and profitable raw material"

- Patrick Thomas, CEO of Bayer Material Science

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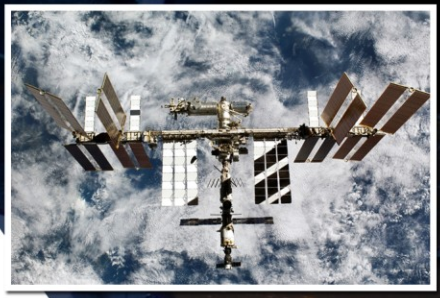
CO_2-Based Manufacturing

The weekend workshop will bring together leading scientists and engineers to learn about new technologies for using CO_2 as a feedstock for manufacturing higher value materials such Topics will include: product identification, CO_2 capture and storage, CO_2 conversion systems (physical, chemical, biological), product harvesting and purification, manufacturing techniques (e.g. 3D printing), economics of CO_2-based manufacturing.



CO_2 is a waste gas on Earth, but a potentially valuable commodity in space. Each human breathes out one kilogram of CO_2 per day. On the International Space Station this CO_2 is converted into water and methane. The water is reused and the methane is currently vented into space. The Martian atmosphere consists of 96% CO_2. For long-term exploration and habitation of Mars, technologies that allow humans to convert CO_2 into higher value products will be critical. Here on Earth, CO_2-based manufacturing technologies are also of value due to the rising levels of CO_2 in our atmosphere that contribute to global climate change.

Outcomes of the Workshop:

The outcome of the workshop will be a written report highlighting the role that different technologies could play in CO_2-based manufacturing. In addition, an economic analysis will be performed, which compares and contrasts the ability of different technologies to provide economic viability on Earth and in space.

Partnership opportunities:

To leverage Earth based opportunities for partnerships, the workshop will invite individuals from industry, academia and government and will provide a venue for new collaborations to be formed.

For logistics or further information, please contact:

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Weekend Workshop on CO_2-Based Manufacturing

Saturday June 28th

TIME	WHAT?	SPEAKER	AFFILIATION
8:00 AM - 8:30 AM	Registration (Building 152)		
8:30 AM - 8:35 AM	Welcome from the Center Director	Pete Worden	NASA Ames Research Center
8:35 AM - 8:40 AM	Welcome from the Chief Scientist	Jacob Cohen	NASA Ames Research Center
8:40 AM - 9:00 AM	Primer: NASA's needs for CO_2-based Manufacturing	John Hogan	NASA Ames Research Center
9:00 AM - 9:20 AM	Primer: NASA's Space Station CO_2 Conversion Program	Morgan Abney	NASA Marshall Space Flight Center
	Chemical / Physical Methods		
9:20 AM - 9:35 AM	The Utility of Biological CO_2-Based Manufacturing on Manned Space Missions	Amor Menezes	UC Berkeley
9:35 AM - 9:50 AM	Electrochemical Production of CO_2-Derived Polymers and Radiation Shielding Materials	Emily Cole	Liquid Light, Inc.
9:50 AM - 10:20 AM	**Break**		
10:20 AM - 10:35 AM	CO_2 Electrolysis with Metal Catalysts to High Value Organic Products	Etosha Cave	Stanford University
10:35 AM - 10:50 AM	Biologically Inspired CO_2 Manufacturing System	Bin Chen	UC Santa Cruz
10:50 AM - 11:50 AM	**Lunch**		
11:50 AM - 12:05 PM	Evaluation and Tuning of Structured Carbon Sorbents for CO_2 Capture	Erik C. Rupp	Stanford University
12:05 PM - 12:20 PM	Recycling CO_2 Using Nanocrystalline Electrocatalysts	Matthew Kanan	Stanford University
	Breakout Sessions with Customers		
12:20 PM - 12:50 PM	Customer Pitch 1		
12:50 PM - 1:50 PM	Breakout Session 1		
1:50 PM - 2:20 PM	Regroup from breakouts		
2:20 PM - 2:50 PM	**Break**		
2:50 PM - 3:20 PM	Customer Pitch 2		
3:20 PM - 4:20 PM	Breakout Session 2		
4:20 PM - 4:50 PM	Regroup from breakouts		
	Keynote Speaker		
4:50 PM - 5:30 PM	The CO_2 atmosphere on Mars and the Martian Environment	Chris McKay	NASA Ames Research Center
5:30 PM - 6:30 PM	Break before Dinner		
6:30 PM - 8:30 PM	**Dinner (on your own)**		
	Fu Lam Mum, 153 Castro Street, Mountain View		

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NASA Workshop on CO2 Utilization and Manufacturing in Space.

Sunday, June 29th

TIME	WHAT?	SPEAKER	AFFILIATION
8:00 AM - 8:30 AM	**Arrival**		
8:30 AM - 8:35 AM	Welcome to day 2	John Cumbers	NASA Ames Space Portal
	Biological Methods of CO2 Conversion		
8:35 AM - 8:50 AM	Synthetic Trees for Water and Energy Efficient Biological CO_2 Conversion	Thomas Murphy	NASA Ames Research Center
8:50 AM - 9:05 AM	Primary Biomass Production Via Electricity and CO_2	Patrick Boyle	Ginkgo BioWorks
9:05 AM - 9:20 AM	Membrane Gas-Liquid Exchange for CO_2 Assimilation in Bioreactor Systems	David Bayless	NASA Ames Research Center
9:20 AM - 9:35 AM	Reduction of CO_2 to CH_4 and Coupling to C_2H_2 to make Alkenes Catalyzed by the Bacterial Enzyme Nitrogenase	Lance Seefeldt	Utah State University
9:35 AM - 9:50 AM	CO_2 Capture and Conversion into Higher Value Chemicals.	Brian Sefton	OakBio Inc.
	Breakout Sessions with Customers		
9:50 AM - 10:20 AM	Customer Pitch 3		
10:20 AM - 11:20 AM	Breakout Session 3		
11:20 AM - 11:50 AM	Regroup from breakouts		
	Synthesis and Wrap Up		
	Close		